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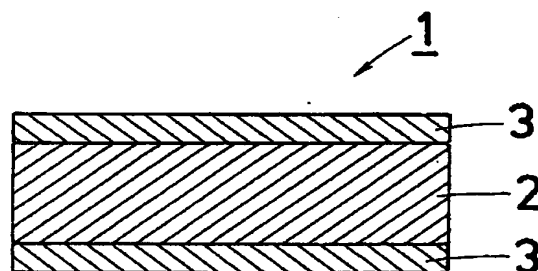
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(54) 【発明の名称】 帯電防止シート

(57) 【要約】

【課題】 種々の用途に使用できるシートであって、帯電防止機能を有するものを提供する。

【解決手段】 プラスチック製の芯シートの表裏両面に、基材樹脂と高分子帯電防止剤との混合物製で、厚みが0.01~1.0mmの表面シートが貼り合わされ、全体の厚みが0.3~3.0mmであるもの。



【特許請求の範囲】

【請求項1】 プラスチック製の芯シートの表裏両面に、基材樹脂と高分子帯電防止剤との混合物製で、厚みが0.01～1.0mmの表面シートが貼り合わされ、全体の厚みが0.3～3.0mmであることを特徴とする帯電防止シート。

【請求項2】 該基材樹脂と高分子帯電防止剤との混合物中、高分子帯電防止剤の重量割合が5～30%である請求項1記載の帯電防止シート。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】本発明は、帯電防止シートに関するものである。

【0002】

【従来の技術】帯電防止シートは、静電気を帯電しないか、ほとんどしないものであって、その用途は、文房具であるバインダーの外装材、ボックスファイル等どのようなものにも使用できる。

【0003】このような文房具等に使用するプラスチックシートが帯電すると、手を触れた時に電気ショックがあり非常に驚くとともに痛いものである。また、プラスチック材料では加工が困難になる場合もある。更に、帯電すると吸塵効果があり表面がどうしても汚れる。

【0004】よって、このようなものには、通常帯電防止剤が混入されている。成型時に練り混むタイプが多い。帯電防止剤としては、界面活性剤が多い。これは吸湿性が大きくなり、電気抵抗値が下がるためである。

【0005】

【発明が解決しようとする課題】しかしながら、このような低分子帯電防止剤では、表面にブリードしてくるまでに時間がかかり、帯電防止機能を発揮するまでに時間がかかる。また、このブリードによって白化する場合もある。また、ブリードして効果を発揮するものであるため、どうしても帯電防止剤が流出し、効果が低下する。

【0006】

【課題を解決するための手段】以上のような現状に鑑み、本発明者は鋭意研究の結果本発明帯電防止シートを完成したものであり、その特徴とするところは、プラスチック製の芯シートの表裏両面に、基材樹脂と高分子帯電防止剤との混合物製であり、厚みが0.01～1.0mmの表面シートを貼り合わせ、全体の厚みが0.3～3.0mmである点にある。

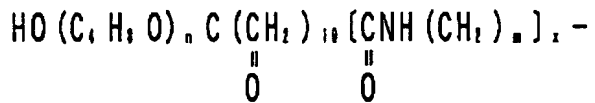
【0007】ここで芯シートとは、後述する混合物製の表面シートが貼り合わすことができるのであれば何でもよい。例えば、ポリエチレン、ポリプロピレン等のポリオレフィン、PET（ポリエステル）、アクリル系、ポリカーボネート等が使用できる。また、着色しても、透明でもよい。

【0008】高分子帯電防止剤とは、高分子自体の構造（官能基）が帯電し難いものであり種々のものが知られ

ている。例えば、ポリエチレンオキシド系、ポリエーテルエステルアミド系、ポリエーテルアミドイミド系、エチレンオキシド-エビハロヒドリン共重合体系、メトキシポリエチレングリコール（メタ）アクリレート共重合体系、4級アンモニウム塩基含有（メタ）アクリレート共重合体系、4級アンモニウム塩基含有マレイミド共重合体系、4級アンモニウム塩基含有メタクリルイミド共重合体系、ポリスチレンスルホン酸ソーダ、カルボベタイングラフト共重合体系、高分子電荷移動型結合体系のもの等がある。

【0009】なかでも、ポリエーテルエステルアミドが好適である。ポリエーテルエステルアミドとは、分子内にエーテル結合、エステル結合と、アミド結合を有するものである。例えば、化1に示す化合物等である。

【化1】



ここで、n、m、xは任意を整数である。

【0010】表面シートは、この高分子帯電防止剤と基材樹脂を混合したものである。基材樹脂は、使用する高分子帯電防止剤と相溶性のよいものを選べばよい。逆にいうと、基材樹脂を決めればそれと相溶性のよい高分子帯電防止剤を用いればよいということである。混合は、両者を加熱して粘度を下げ、混練するか、十分融解させて混合するか等である。両者の混合比率は、特に限定はしない。しかし、高分子帯電防止剤が高価なため、通常は5～30%程度にするのがよい。この表面シートは、0.01～1.0mmである。これは、費用と帯電防止機能から求めたものである。

【0011】3層の貼り合わせ方法は、接着剤を使用してもよいが、3層押出ラミネート方法がよい。これは、芯シートと表面シートをダイから押し出した直後（硬化前）に、貼り合わせ冷却する方法である。また、押し出す前にすでに1層のようにして、1つのダイから押し出す方法もある。これらの方法では、接着剤が不要であり、製造工程も少なくなる。

【0012】本発明帯電防止シートは、この3層が必須成分であるが、この他のシートを設けても構わない。例えば、芯シートを2層以上にしたり、表面シートを複数にする等である。

【0013】表面の傷が目立たないように、表面にエンボス加工を施してもよい。エンボス加工とは、表面に種々の凹凸を設ける加工であり、通常は硬化前にエンボスロール中を通過させることによって行なう。最も適当なエンボスでの凹凸としては、表面粗さでは、1～80μm、表面光沢はGs（60°）で1～50%であった。

【0014】

【発明の実施の形態】以下図面に示す実施の形態に基づ

いて本発明をより詳細に説明する。図1は、本発明シート1の1例を示す断面図である。この例では、芯シート2はポリプロピレンの再生シートであり、厚みは900 μ である。また、表面シート3は、ポリプロピレンとポリエーテルエステルポリアミドとの混合物製のもので、共押出成型したものである。また、厚みは表裏とも50 μ である。

【0015】図2は、本発明のシートの製法の1例を示すもので、押出機のダイの内部で3層は1層にされ、1つの口から押し出される。中間部のものが、芯シート2 10であり、左右の2つが表面シート3である。エンボス加工する場合には、1層で押し出されたシートは、エンボスロール4でエンボス加工される。ロールに凹凸が設け*

*られているのである。この例では、ダイの手前で1層にされているが、出た後に貼り合わせてもよい。このような製法では、1工程で貼り合わせ、エンボスができるため製造が簡単であり、接着剤も不要である。

【0016】次に本発明シート（図1に示したもの）と従来のシート（ポリプロピレンシート）とを同じ厚みに構成し、両者の性能を比較した。

試験1（ラビング試験）

ガーゼに下記溶液を含浸させ、シート表面を5回擦った後、20℃、湿度60%の条件下で24時間放置し、表面固有抵抗値を測定した。その結果は表1の通りであった。

【表1】

	表面固有抵抗値（ Ω ）	
	実施例	従来例
試験前	1.96×10^{10}	1.22×10^{12}
溶液1（水）	2.35×10^{10}	5.20×10^{14}
溶液2（エタノール）	2.33×10^{10}	1.97×10^{14}

まず、実施前、即ち何もしない状態で実施例のシートと従来のシートでは表面固有抵抗値に大きな差があり、実施例が非常に優れていることがわかる。また、摩擦後においても、従来のシートでは、表面固有抵抗値が2桁大きくなっているにもかかわらず、実施例のシートではほとんど変化はなかった。よって摩擦された場合には、従*

※来シートとの差がより大きくなるのである。

【0017】試験2（煮沸試験）

沸騰水中でシートを2時間煮沸した後、20℃、湿度60%の条件下で24時間放置し、表面固有抵抗値を測定した。その結果は表2の通りであった。

【表2】

	表面固有抵抗値（ Ω ）	
	実施例	従来例
試験前	1.96×10^{10}	1.22×10^{12}
実施後	1.48×10^{10}	3.19×10^{14}

これも前記したラビング試験と同様、実施例と従来のシートとでは大きな差があった。

【0018】試験3（耐候性試験）

サンシャインウェザーメーター（ブラックパネル温度、★40

★63℃）中に100時間暴露後、20℃、湿度60%の条件下で24時間放置し、表面固有抵抗値を測定した。その結果は表3の通りであった。

【表3】

	表面固有抵抗値（ Ω ）	
	実施例	従来例
試験前	1.96×10^{10}	1.22×10^{12}
実施後	1.24×10^{10}	1.00×10^{16}

これも前記したラビング試験と同様、実施例と従来のシートとでは大きな差があった。即ち、実施例では非常に

長期間帯電防止効果が持続するということである。

【0019】試験4（ダートチェンバー試験）

活性炭1gをシートに吹き付け、付着状態を観察した。 *【表4】
その結果は表4の通りであった。 *

	付着状態	
	実施例	従来例
活性炭吹き付け	均一に付着	ムラあり

この結果から、従来のシートでは局部的に帯電していることがわかる。

【0020】

【発明の効果】本発明シートには、次のような大きな利点がある。

- 1) 表面固有抵抗値が非常に小さく、ほとんど帯電しない。
- 2) 帯電機能が、種々の条件下においてもほとんど低下しない。また、非常に長期間持続する。
- 3) 帯電防止機能の発現がシートの成型時と同時であり、ブリードを待つ必要はない。
- 4) サンドイッチ構造であるため、高価なポリエーテル 20 エステルアミドが少なくすみ、全体として従来の低分※

※子帯電防止剤を混合するものと、価格的にはあまり変わらない。

- 5) 従来シートに比べ、ブリードがなく印刷性が良好である。

【図面の簡単な説明】

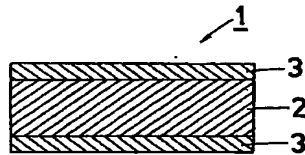
【図1】本発明帯電防止シートの1例を示す断面図である。

【図2】本発明シートの製法を示す断面図である。

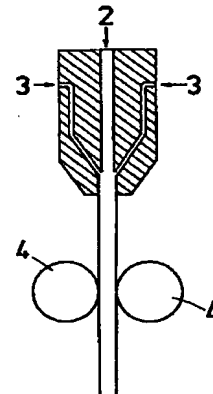
【符号の説明】

- 1 本発明シート
- 2 芯シート
- 3 表面シート
- 4 エンボスロール

【図1】



【図2】



フロントページの続き

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AK07 AK14H AK25 AK25H
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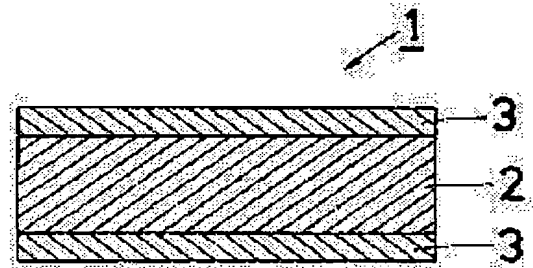
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(54) ANTISTATIC SHEET

(57)Abstract:

PROBLEM TO BE SOLVED: To realize quick manifestation of an antistatic function and long term maintenance of antistatic properties without lowering antistatic effects by a method wherein a surface sheet, which is made of the mixture of a base material resin and a polymer antistatic agent and has a specified thickness, is pasted to both the front and the rear surfaces of a plastic core sheet so as to have a specified total thickness.

SOLUTION: Polyolefin, polycarbonate or the like is employed as a core sheet 2. A polyethylene oxide-based antistatic agent, a polymer charge transfer type binder-based antistatic agent or the like having an ether linkage, an ester linkage and an amide linkage within a molecule is employed as a polymer antistatic agent. A surface sheet 3 is produced by lowering the viscosity of a mixture of the polymer antistatic agent and a base material resin under heat so as to be kneaded and moltenly mixed into the thickness of 0.01 to 1.0 mm. The pasting between the surface sheet and the core sheet 2 is executed by a three layer extrusion laminating method, which is performed by pasting together the surface sheet 3 and the core sheet 2 just after their extrusion from a die and cooling in order to realize the total thickness of 0.3 to 3.0 mm. Thus, an antistatic function is kept without lowering over a long period of time and its manifestation is simultaneous with its molding.



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CLAIMS

[Claim(s)]

[Claim 1] An antistatic sheet which a surface sheet whose thickness is 0.01–1.0mm is stuck on front reverse side both sides of a heart sheet made from plastics by product made from mixture of base material resin and a macromolecule antistatic agent, and is characterized by the whole thickness being 0.3–3.0mm.

[Claim 2] An antistatic sheet according to claim 1 whose weight percentage of the inside of mixture of this base material resin and a macromolecule antistatic agent and a macromolecule antistatic agent is 5 – 30%.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[The technical field to which invention belongs] This invention relates to an antistatic sheet.

[0002]

[Description of the Prior Art] It does not carry out whether an antistatic sheet is charged in static electricity, and the use can be used for anythings, such as a sheathing material of the binder which is stationery, and a box file.

[0003] When the sheet plastic used for such stationery etc. is charged, it is painful, while there is an electroshock and it is very much surprised, when a hand is touched. Moreover, in plastic material, processing may become difficult. Furthermore, if charged, there will be the dust-collecting effect and the surface will surely become dirty.

[0004] Therefore, the antistatic agent is usually mixed in such a thing. There are many types which scour and are crowded at the time of molding. There is much surfactant as an antistatic agent. This is for hygroscopicity to become large and for an electric resistance value to fall.

[0005]

[Problem(s) to be Solved by the Invention] However, in such a low-molecular antistatic agent, before carrying out bleeding to the surface, time amount will be taken, and before demonstrating an antistatic function, it will take time amount. Moreover, it may milk with this bleeding. Moreover, since it is what carries out bleeding and demonstrates an effect, an antistatic agent surely flows out and an effect falls.

[0006]

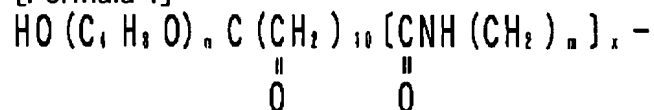
[Means for Solving the Problem] In view of the above present condition, this invention person used to complete this invention antistatic sheet wholeheartedly as a result of research, and to front reverse side both sides of a heart sheet made from plastics, a place by which it is characterized [the] is the product made from mixture of base material resin and a macromolecule antistatic agent, and is in lamination and a point that the whole thickness is 0.3-3.0mm, about a surface sheet whose thickness is 0.01-1.0mm.

[0007] A heart sheet is good anything here, if a surface sheet made from mixture mentioned later can stick. For example, polyolefines, such as polyethylene and polypropylene, PET (polyester), acrylic, a polycarbonate, etc. can be used. Moreover, it may color or transparency is sufficient.

[0008] Structure (functional group) of the macromolecule itself cannot be charged easily, and, as for a macromolecule antistatic agent, various things are known. For example, there is a thing of a polyethylene oxide system, a polyether ester amide system, a polyether amide imide system, an ethylene oxide-epihalohydrin copolymer system, a methoxy polyethylene-glycol (meta) acrylate copolymer system, a quarternary-ammonium-salt radical content (meta) acrylate copolymer system, a quarternary-ammonium-salt radical content maleimide copolymer system, a quarternary-ammonium-salt radical content methacrylic imide copolymer system, polystyrene sulfonate soda, a carbobetaine graft copolymer system, and a macromolecule charge transfer mold joint system etc.

[0009] Especially, a polyether ester amide is suitable. A polyether ester amide has ether linkage, an ester bond, and amide association in intramolecular. For example, it is the compound shown in ** 1.

[Formula 1]



Here, n, m, and x are integers about arbitration.

[0010] A surface sheet mixes base material resin with this macromolecule antistatic agent. Base material resin should just choose what has the good macromolecule antistatic agent to be used and compatibility. Conversely, when it says, if base material resin is decided, I hear that what is necessary is just to use a macromolecule antistatic agent with sufficient it and compatibility, and it is. Mixing heats both and is lowering, whether it kneads, or to make it dissolve enough and to mix about viscosity. Both mixed ratio does not carry out especially limitation. However, since the macromolecule antistatic agent is expensive, it is good to usually make it to about 5 – 30%. This surface sheet is 0.01–1.0mm. It asks for this from costs and an antistatic function.

[0011] Although adhesives may be used for the lamination method of three layers, its three-layer extrusion lamination method is good. This is the method of carrying out lamination cooling immediately after extruding a heart sheet and a surface sheet from a die (before hardening). Moreover, before extruding, it already carries out like one layer, and there is also the method of extruding from one die. By these methods, adhesives are unnecessary and a manufacturing process also decreases.

[0012] this invention antistatic sheet may prepare other sheets, although these three layers are indispensable components. For example, it is carrying out a heart sheet more than two-layer, or making a surface sheet into plurality etc.

[0013] Embossing may be performed to the surface so that a surface blemish may not be conspicuous. Embossing is processing which prepares various irregularity in the surface, and it carries out by usually passing the inside of an embossing roll before hardening. As irregularity in the most suitable embossing, 1–80 micrometers and surface gloss were 1 – 50% in Gs (60 degrees) at surface roughness.

[0014]

[Embodiment of the Invention] Based on the gestalt of operation shown in a drawing below, this invention is explained more to details. Drawing 1 is the cross section showing one example of this invention sheet 1. In this example, the heart sheet 2 is a playback sheet of polypropylene, and thickness is 900micro. Moreover, the surface sheet 3 is a thing made from the mixture of polypropylene and a polyether ester polyamide, and carries out co-extrusion molding. Moreover, the front reverse side of thickness is 50micro.

[0015] Drawing 2 shows one example of the process of the sheet of this invention, and three layers are made into one layer inside the die of an extruder, and it extrudes from one opening. The thing of pars intermedia is the heart sheet 2, and two of right and left are the surface sheet 3. When carrying out embossing, embossing of the sheet extruded by one layer is carried out with an embossing roll 4. Irregularity is prepared in the roll. In this example, although made one layer before the die, it may stick, after coming out. Since lamination and embossing can be performed at one production process in such a process, manufacture is easy and adhesives' is unnecessary.

[0016] Next, this invention sheet (what was shown in drawing 1), and the conventional sheet (polypropylene sheet) were constituted in the same thickness, and both engine performance was compared.

Trial 1 (rubbing trial)

After carrying out impregnation of the following solution to gauze and grinding the sheet surface 5 times, it was left under 20 degrees C and conditions of 60% of humidity for 24 hours, and the surface specific resistance value was measured. The result was as in a table 1.

[A table 1]

	表面固有抵抗値 (Ω)	
	実施例	従来例
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溶液 1 (水)	2.35×10^{10}	5.20×10^{14}
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First, it turns out that a big difference is in a surface specific resistance value with the sheet of an

example, and the conventional sheet by before operation (i.e., the condition of doing nothing), and the example is very excellent. Moreover, although the double figures surface specific resistance value was large with the conventional sheet after friction, with the sheet of an example, it was almost changeless. Therefore, when rubbed, a difference with a sheet becomes larger conventionally.

[0017] Trial 2 (boiling test)

After boiling a sheet in a boiling water for 2 hours, it was left under 20 degrees C and conditions of 60% of humidity for 24 hours, and the surface specific resistance value was measured. The result was as in a table 2.

[A table 2]

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There was a big difference with an example and the conventional sheet like the rubbing trial which also described this above.

[0018] Trial 3 (weathering test)

It was left under 20 degrees C and conditions of 60% of humidity after 100-hour exposure in the sunshine weather meter (black panel temperature, 63 degrees C) for 24 hours, and the surface specific resistance value was measured. The result was as in a table 3.

[A table 3]

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There was a big difference with an example and the conventional sheet like the rubbing trial which also described this above. That is, in the example, I hear that the antistatic effect continues very much for a long period of time, and it is.

[0019] Trial 4 (dirt chamber trial)

Blasting and an adhesion condition were observed for 1g of activated carbon on the sheet. The result was as in a table 4.

[A table 4]

	付着状態	
	実施例	従来例
活性炭吹き付け	均一に付着	ムラあり

This result shows being charged locally with the conventional sheet.

[0020]

[Effect of the Invention] There are the following big advantages in this invention sheet.

- 1) A surface specific resistance value is very small, and it is hardly charged.
- 2) An electrification function hardly falls to the bottom of various conditions. Moreover, it continues very much for a long period of time.
- 3) The manifestation of an antistatic function is simultaneous with the time of molding of a sheet, and does not need to wait for bleeding.

- 4) Since it is sandwich structure, there are few expensive polyether ester amides, they end, and seldom change in [as what mixes the conventional low-molecular antistatic agent as a whole] price.
- 5) Compared with a sheet, there is no bleeding and printing nature is conventionally good.
-

[Translation done.]

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TECHNICAL FIELD

[A technical field to which invention belongs] This invention relates to an antistatic sheet.

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PRIOR ART

[Description of the Prior Art] It does not carry out whether an antistatic sheet is charged in static electricity, and the use can be used for anythings, such as a sheathing material of the binder which is stationery, and a box file.

[0003] When the sheet plastic used for such stationery etc. is charged, it is painful, while there is an electroshock and it is very much surprised, when a hand is touched. Moreover, in plastic material, processing may become difficult. Furthermore, if charged, there will be the dust-collecting effect and the surface will surely become dirty.

[0004] Therefore, the antistatic agent is usually mixed in such a thing. There are many types which scour and are crowded at the time of molding. There is much surfactant as an antistatic agent. This is for hygroscopicity to become large and for an electric resistance value to fall.

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EFFECT OF THE INVENTION

[Effect of the Invention] There are the following big advantages in this invention sheet.

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] However, in such a low-molecular antistatic agent, before carrying out bleeding to the surface, time amount will be taken, and before demonstrating an antistatic function, it will take time amount. Moreover, it may milk with this bleeding. Moreover, since it is what carries out bleeding and demonstrates an effect, an antistatic agent surely flows out and an effect falls.

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MEANS

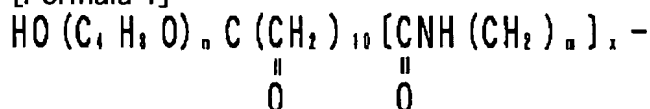
[Means for Solving the Problem] In view of the above present condition, this invention person used to complete this invention antistatic sheet wholeheartedly as a result of research, and to front reverse side both sides of a heart sheet made from plastics, a place by which it is characterized [the] is the product made from mixture of base material resin and a macromolecule antistatic agent, and is in lamination and a point that the whole thickness is 0.3–3.0mm, about a surface sheet whose thickness is 0.01–1.0mm.

[0007] A heart sheet is good anything here, if a surface sheet made from mixture mentioned later can stick. For example, polyolefines, such as polyethylene and polypropylene, PET (polyester), acrylic, a polycarbonate, etc. can be used. Moreover, it may color or transparency is sufficient.

[0008] Structure (functional group) of the macromolecule itself cannot be charged easily, and, as for a macromolecule antistatic agent, various things are known. For example, there is a thing of a polyethylene oxide system, a polyether ester amide system, a polyether amide imide system, an ethylene oxide–epihalohydrin copolymer system, a methoxy polyethylene–glycol (meta) acrylate copolymer system, a quarternary–ammonium–salt radical content (meta) acrylate copolymer system, a quarternary–ammonium–salt radical content maleimide copolymer system, a quarternary–ammonium–salt radical content methacrylic imide copolymer system, polystyrene sulfonate soda, a carbobetaine graft copolymer system, and a macromolecule charge transfer mold joint system etc.

[0009] Especially, a polyether ester amide is suitable. A polyether ester amide has ether linkage, an ester bond, and amide association in intramolecular. For example, it is the compound shown in ** 1.

[Formula 1]



Here, n, m, and x are integers about arbitration.

[0010] A surface sheet mixes base material resin with this macromolecule antistatic agent. Base material resin should just choose what has the good macromolecule antistatic agent to be used and compatibility. Conversely, when it says, if base material resin is decided, I hear that what is necessary is just to use a macromolecule antistatic agent with sufficient it and compatibility, and it is. Mixing heats both and is lowering, whether it kneads, or to make it dissolve enough and to mix about viscosity. Both mixed ratio does not carry out especially limitation. However, since the macromolecule antistatic agent is expensive, it is good to usually make it to about 5 – 30%. This surface sheet is 0.01–1.0mm. It asks for this from costs and an antistatic function.

[0011] Although adhesives may be used for the lamination method of three layers, its three–layer extrusion lamination method is good. This is the method of carrying out lamination cooling immediately after extruding a heart sheet and a surface sheet from a die (before hardening). Moreover, before extruding, it already carries out like one layer, and there is also the method of extruding from one die. By these methods, adhesives are unnecessary and a manufacturing process also decreases.

[0012] this invention antistatic sheet may prepare other sheets, although these three layers are indispensable components. For example, it is carrying out a heart sheet more than two–layer, or making a surface sheet into plurality etc.

[0013] Embossing may be performed to the surface so that a surface blemish may not be conspicuous. Embossing is processing which prepares various irregularity in the surface, and it carries out by usually

passing the inside of an embossing roll before hardening. As irregularity in the most suitable embossing, 1–80 micrometers and surface gloss were 1 – 50% in Gs (60 degrees) at surface roughness.

[0014]

[Embodiment of the Invention] Based on the gestalt of operation shown in a drawing below, this invention is explained more to details. Drawing 1 is the cross section showing one example of this invention sheet 1. In this example, the heart sheet 2 is a playback sheet of polypropylene, and thickness is 900micro. Moreover, the surface sheet 3 is a thing made from the mixture of polypropylene and a polyether ester polyamide, and carries out co-extrusion molding. Moreover, the front reverse side of thickness is 50micro.

[0015] Drawing 2 shows one example of the process of the sheet of this invention, and three layers are made into one layer inside the die of an extruder, and it extrudes from one opening. The thing of pars intermedia is the heart sheet 2, and two of right and left are the surface sheet 3. When carrying out embossing, embossing of the sheet extruded by one layer is carried out with an embossing roll 4. Irregularity is prepared in the roll. In this example, although made one layer before the die, it may stick, after coming out. Since lamination and embossing can be performed at one production process in such a process, manufacture is easy and adhesives' is unnecessary.

[0016] Next, this invention sheet (what was shown in drawing 1), and the conventional sheet (polypropylene sheet) were constituted in the same thickness, and both engine performance was compared.

Trial 1 (rubbing trial)

After carrying out impregnation of the following solution to gauze and grinding the sheet surface 5 times, it was left under 20 degrees C and conditions of 60% of humidity for 24 hours, and the surface specific resistance value was measured. The result was as in a table 1.

[A table 1]

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First, it turns out that a big difference is in a surface specific resistance value with the sheet of an example, and the conventional sheet by before operation (i.e., the condition of doing nothing), and the example is very excellent. Moreover, although the double figures surface specific resistance value was large with the conventional sheet after friction, with the sheet of an example, it was almost changeless. Therefore, when rubbed, a difference with a sheet becomes larger conventionally.

[0017] Trial 2 (boiling test)

After boiling a sheet in a boiling water for 2 hours, it was left under 20 degrees C and conditions of 60% of humidity for 24 hours, and the surface specific resistance value was measured. The result was as in a table 2.

[A table 2]

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is the cross section showing one example of this invention antistatic sheet.

[Drawing 2] It is the cross section showing the process of this invention sheet.

[Description of Notations]

1 This Invention Sheet

2 Heart Sheet

3 Surface Sheet

4 Embossing Roll

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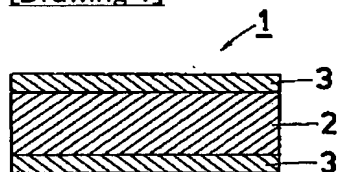
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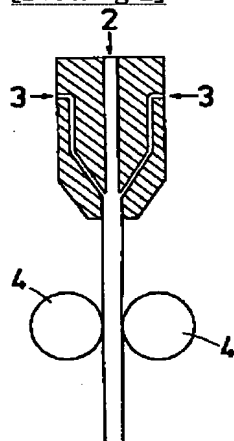
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DRAWINGS

[Drawing 1]



[Drawing 2]



[Translation done.]